REMARKS

Reconsideration and withdrawal of the rejection and the allowance of all claims now pending in the above-identified patent application (i.e., Claims 10-21) are respectfully requested in view of the foregoing amendments and the following remarks.

At the outset, it should be recognized that the present invention relates to an electron-optical lens arrangement with an axis that can be largely displaced, particularly for use in electron lithography, with a cylinder lens and a quadrupole field. The quadrupole field has a plane of symmetry extending in the mid-plane of a gap pertaining to the cylinder lens with the focussing plane of the quadrupole field being aligned in the direction of the gap, and with the magnitude of the focussing refractive power belonging to the cylinder lens being twice as high as that of the quadrupole field. A deflection system for charged particles is connected downstream in the plane of the gap pertaining to the cylinder lens with the quadrupole field being displaceable according to a paraxial deflection of a particle beam, so that the particle beam impinges in an area of said quadrupole field.

As will be explained in greater detail hereinafter, nowhere in the prior art is such a novel and efficient electron-optical lens arrangement, having an axis that can be

largely displaced, either disclosed or suggested.

By the present amendments, Applicants have amended independent Claim 10 in order to specify that the downstream deflection system of the claimed lens arrangement, comprising the cylinder lens and the quadrupole field, creates a paraxial deflection of the particle beam and, as such, the deflection system of the instant invention is vastly different from that disclosed and suggested by the secondary citation of Richardson, U.S. Patent No. 4,912,405, as will be further explained. (Dependent Claim 19 has also been amended in order that the language of this claim is consistent with the newly-amended version of Claim 10.)

Turning now, in detail, to an analysis of the Examiner's prior art rejection of Applicants' claims, in the first Office Action the Examiner has rejected pending Claims 10-21 as being obvious, pursuant to 35 U.S.C. §103(a), over Henstra et al., U.S. Patent No. 6,184,975, taken in view of Richardson, U.S. Patent No. 4,912,405. It is the Examiner's contention that Henstra et al. discloses an electrostatic device for correcting the chromatic aberration in a particle-optical apparatus, which includes many of the same features of the invention being claimed by the instant Applicants. The Examiner, however, has acknowledged that Henstra et al. fails to disclose the use of magnetic deflectors for producing an emerging particle stream travelling parallel to the incident

electron beam and, accordingly, has secondarily applied Richardson for its contended teaching of a deflection system capable of providing a parallel electron beam incident upon the correction device, so that the quadrupole fields of the corrector could more accurately produce an exit beam incident upon a specimen with practically no chromatic magnification error.

In reply to the Examiner's obviousness rejection applying Henstra et al., taken in view of Richardson, the primary citation of Henstra et al. discloses a corrector device which includes quadrupole elements and two correction elements (34, 40) that could be used as cylinder lenses. Accordingly, Henstra et al. teaches a corrector apparatus in which quadrupole and cylinder lenses are arranged on a straight optical axis, and along this axis the particle beam (*i.e.*, electron beam) is propagating. FIG. 4 of Henstra et al. illustrates how to construct and shape the quadrupole lens, which is well-known to the state of the art and is not relevant to the concept of the presently-claimed invention.

The corrector apparatus disclosed by Henstra et al. differs significantly from Applicants' present invention in that the lenses (quadrupole and cylinder) are positioned coaxially and centrally on the optical axis. Consequently, the deflection of the particle beam is limited by the boring in the quadrupole lens. It therefore becomes physically impossible

with the corrector apparatus taught in Henstra et al. to deflect the optical beam beyond the border of the boring and in the direction away from the optical axis. Stated differently, the particle beam in Henstra et al. could not largely be displaced, in contrast to the presently-claimed invention. The boring of the fixed quadrupole in the Henstra et al. corrector device is limiting the displacement.

Concerning the secondarily-applied reference of Richardson, this citation discloses a deflection system with a beam, which is paraxial to the optical axis. The basic problem that Richardson seeks to solve is the elimination of chromatic aberration, with which Applicants' claimed invention is not concerned. It is of importance that the collimating magnetic lens (116) in Richardson is fixed in its position and is located with its axis outside the optical axis. In addition, FIG. 8 of Richardson is described at Col. 10, lines 17-44, in which the collimating magnetic lens (116) is concentric to the optical axis.

The most significant differences between that taught and suggested in the prior art and the presently-claimed invention is that Applicants' invention includes a deflection system "downstream," which includes a cylinder lens and a quadrupole field creating a paraxial deflection of the particle beam. Also important is the spatial displacement of the quadrupole field by electronic means, during the active phase,

perpendicular to the optical axis. In that region, in which the particle beam is impinging, the quadrupole field is excited. Applicants' invention has a plurality of electrodes (electric lenses) or pole shoes (magnetic lenses) that are physically oriented in the direction of the gap of the cylinder lens, but only one of these quadrupole lenses is activated and excited at a certain point in time. Exactly this quadrupole lens is the impingement point of the particle beam. The "mechanical quadrupoles," or electrodes and pole shoes, are fixed, whereas one electrode thereof is electrically excited so that a quadrupole field is created, which is influencing the particle beam.

During operation, the quadrupole field is running along a line perpendicular to the optical axis and defined by the electrodes/pole shoes. This arrangement allows for a large displacement of the axis of the particle beam, with the advantage that no additional electron optical aberrations are created. For understanding the present invention, it is of importance to realize that many electrodes are existing, which are inactive (except for one thereof) and the movement of quadrupole fields is created by electronic means by exciting one pair of electrodes in the impinging point, whereas the device itself remains physically fixed.

In summation, the primarily-applied reference of Henstra et al. provides a corrector device in which the quadrupole

and cylinder lenses are positioned coaxially and centrally on the optical axis, with deflection of the partial beam being limited by a boring in the quadrupole lens. As a result, it becomes physically impossible in the Henstra et al. apparatus to deflect the optical beam beyond the border of the boring and in the direction away from the optical axis, thereby preventing the particle beam from being largely displaced. The primary reference of Henstra et al., as a result, teaches a corrector device that differs from that now claimed by the present Applicants in more than simply the deflection system recited in pending independent Claim 10.

As for the secondarily-applied reference of Richardson, this reference does not disclose or suggest a deflection system which creates a paraxial deflection of the particle beam, as does the present invention, as now claimed.

Hence, even if one skilled in the art modified the Henstra et al. corrector device to incorporate the deflection system of Richardson, one would still not arrive at that now being claimed by the present Applicants, since the differences between Henstra et al. and the present invention extend beyond simply the deflection system of the claimed invention, and the deflection system of Richardson and that of Applicant's invention also differ from one another.

Accordingly, withdrawal of the Examiner's 35 U.S.C. §103(a) obviousness rejection of Claims 10-21, which applies

Henstra et al., taken in view of Richardson, is respectfully requested.

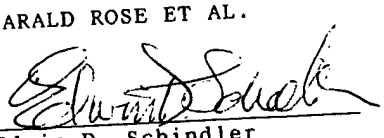
Concerning, finally, the remaining references made of record by the Examiner, but not applied in any rejection of Applicants' claims, such additional art references have been carefully considered, but are not believed to adversely affect the patentability of the present invention, as claimed.

In light of the foregoing, it is respectfully contended that all claims now pending in the above-identified patent application (i.e., Claims 10-21) recite a novel and efficient electron-optical lens arrangement, useful for electron lithography, having an axis that can be largely displaced and with a quadrupole field being displaceable according to a paraxial deflection of a particle beam, so that the particle beam impinges in an area of the quadrupole field, which is patentably distinguishable over the prior art. Accordingly, withdrawal of the outstanding rejection and the allowance of all

claims now pending are respectfully requested and earnestly solicited.

Respectfully submitted,

HARALD ROSE ET AL.

By 

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Enc.: 1. Petition for Three-Month Extension of time; and,

2. Check for $475.00 (Three-Month Extension Fee).

The Commissioner is hereby authorized to charge the Deposit Account of Applicants' Attorney, Account No. 19-0450, for any additional fees which may be due in connection with the prosecution of the present application, but which have not otherwise been provided for.